	Reg. No.:	
	Name :	

VIT® BHOPAL

www.vitbhopal.ac.in

TERM END EXAMINATIONS (TEE) – December 2021- January 2022

Programme	**B.Tech**	**Semester**	**Fall 2021-2022**
Course Name	**Calculus and Laplace Transform**	**Course Code**	**MAT1001**
Faculty Name	**Dr. Navneet Kumar Verma**	**Slot / Class No**	**(C11+C12+C13)/0131**
Time	**1½ hours**	**Max. Marks**	**50**

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART - A (30 Marks)	
1	(a)	A tree trunk of length l metres has the shape of a frustum of a circular cone with radii of its ends a and b metres where $a > b$. Find the length of a beam of uniform square cross section which can be cut from the tree trunk show that the beam has the greatest volume $\frac{8a^3 l}{27(a-b)}$	10
		OR	
	(b)	Change the order of integration and evaluate $\int_0^1 dx \int_{y=1}^{\infty} e^{-y} y^x \log y \, dy$ with use of proper diagram the change on diagram.	10
2	(a)	State the stroke's theorem and verify this theorem for $F = xzi - yj + x^2 yk$, where S is the surface of the region bounded by x = 0, y = 0, z = 0 and 2x+y+2z = 8 which is not included on x-z plane	10
		OR	
	(b)	Using the Legendre's homogeneous differential equation method solve the given differential equation $(3x+2)^2 \frac{d^2y}{dx^2} - (3x+2)\frac{dy}{dx} - 12y = 6x$	10
3	(a)	Solve the given equations by Laplace transform $\frac{d^3y}{dt^3} + 2\frac{d^2y}{dt^2} - \frac{dy}{dt} - 2y = 0, where\ y = 1, \frac{dy}{dt} = 2\ at\ t = 0$	10
		OR	

	(b)	**i.** Find the Laplace transform of $te^{-4t}\sin 3t$ **ii.** Find the Laplace transform of $\int_0^t \frac{\sin t}{t}\,dt$	**10**
PART - B (20 Marks)			
4		A condenser of capacity C is charged through the inductance L and resistance K in series and the charge q at any time t satisfies the equation $L\frac{d^2q}{dt^2}+R\frac{dq}{dt}+\frac{q}{C}=0$. Given that L= 0.25 henry, R=250 ohms, $C=2\times10^6\ farad$ and that when t=0, the charge q is 0.002 coulombs, and current $\frac{dq}{dt}=0$ obtain the value of q in terms of t.	**10**
5		Solve the given inverse Laplace transform by implementing convolution theorem $L^{-1}\left\{\frac{s}{(s^2+1)(s^2+4)}\right\}$	**10**
⇔⇔⇔			